

REMARKS

Claims 1-8, 11-16, and 18-22 are pending in the instant application, with claims 1 and 22 in independent form. Claim 22 is new and is similar to claim 1 but further specifies that the substrate is plasma treated utilising an atmospheric pressure glow discharge source, support for which can at least be found in claim 3, which specifies various sources of plasma in Markush format. No claims are currently amended or cancelled. Claims 9-10 and 17 were previously cancelled. Claims 19 and 20 stand withdrawn from consideration as directed to non-elected subject matter that was subject to a restriction requirement.

Claims 1-5, 7, 8, 11-13, 15, 16, and 21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Bao et al. (U.S. Pre-Grant Pub. No. 2004/0231781) in view of Clem et al. (U.S. Patent No. 6,518,168). Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Bao et al. and Clem et al. as applied to claim 1 in further view of Spence (U.S. Patent No. 6,083,355). Claims 14 and 18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Bao et al. and Clem et al. as applied to claim 1 in further view of Nomura et al. (U.S. Pre-Grant Pub. No. 2003/0211342). In view of the additional evidence submitted herewith, the Applicants respectfully maintain the traverse of the rejection of independent claim 1, as well as the claims that depend therefrom, over Bao et al. in view of Clem et al. on the basis that those of ordinary skill in the art would **not** reasonably have been expected to practice the invention claimed in independent claim 1 based upon the teachings of Bao et al. and Clem et al. The Applicants further submit that the Examiner's rejection of claim 6 that further relies upon the teachings of Spence is clearly in error and does not account for every element of claim 6. The Applicants further submit that new independent claim 22 is neither obvious nor anticipated by any of the

references relied upon by the Examiner because none of the references teach utilizing an atmospheric pressure glow discharge source for plasma treating the substrate.

As to the Rejection of Claim 1 Under 35 U.S.C. §103(a) Over Bao et al. in View of Clem et al.

This rejection was maintained by the Examiner after Applicants' prior response in which this rejection was traversed by the Applicants through argument alone. The Applicants do not provide a lengthy retread of the proper standards for obviousness. However, it is again noted that, as succinctly summarized in MPEP 2141(II.), the focus when making a determination of obviousness should be on what a person of ordinary skill in the pertinent art **would have known at the time of the invention, and on what such a person would have reasonably expected to have been able to do in view of that knowledge** (emphasis added). Further, it remains a tenet of patent law that to establish *prima facie* obviousness, the Examiner must account for every element of the claim in the prior art.

Obviousness of independent claim 1 hinges upon whether a person of ordinary skill in the art would reasonably have been expected to utilize the claimed silicon-containing polymers or oligomers as liquid coating materials to be applied through a lithographic printing technique on a plasma-treated substrate in view of the teachings of Bao et al., in which plasma treating a substrate is taught followed by printing with an organic polymer coating material (with no teaching of silicon-containing materials being suitable for the coating material and with explicit teachings of silanes being suitable as surface modifiers for a mold), and further in view of the teachings of Clem et al. (which are discussed in

further detail below **and which do not even teach that silicon-containing polymers can be printed**).

The Applicants respectfully submit that the accompanying evidence further supports the Applicants' position that a person of skill in the art would **not** be expected to utilize silicon-containing polymers or oligomers as liquid coating materials to be applied to plasma treated substrates, as claimed, based upon the teachings of Bao et al. and Clem et al. The new evidence submitted herewith is relied upon, in part, to support the Applicants' further traversals based upon the Examiner's responses to Applicants' prior arguments.

The Examiner has responded to Applicants' position that those of skill in the art would have known the difficulties of printing preformed siloxane polymers by opining that this fact does not mean that one of ordinary skill in the art would not consider using polysiloxanes in the invention of Bao et al. The Examiner has noted the teachings of Bao et al. in regards to the focus on utilizing surface energy modifiers in the invention thereof, with no particular concern as to the exact polymer being deposited such that use of any polymer as the liquid coating material would benefit from the teachings of Bao et al. While the Examiner may be correct in opining that awareness of the difficulties associated with a given endeavor does not necessarily mean that a person of skill in the art would not attempt such an endeavor, **the Examiner has failed to produce prior art showing that printing of a preformed silicon-containing polymer or oligomer is even known in the art.** As previously argued (and as set forth in further detail below), Clem et al. **never** teaches printing a preformed siloxane polymer or oligomer coating material. Further, the Examiner's recognition that the benefits of Bao et al. do not depend upon a particular type of ink actually proves the Applicants' position that those of skill in the art would not

reasonably expect the problems with printing preformed siloxane polymer or oligomer coating materials to be solved based upon the teachings of Bao et al. After all, as previously noted and as set forth in further detail below, the problems with printing preformed siloxane polymers and oligomers is that such materials have very low surface tension and spread over the substrate upon which they are applied, thus losing definition of the printed pattern. However, such issues are not of concern in Bao et al., where the only concern is clean mold release and excellent pattern definition achieved by modifying surface features of the mold.

In view of the foregoing, although possibly not dispositive on its own, the fact that those of skill in the art are aware of the difficulties associated with printing preformed siloxane polymers and oligomers as coating materials is certainly relevant to the question of what one of ordinary skill in the art would reasonably have been expected to do in view of the teachings of Bao et al. In fact, the mere disclosure of plasma treating a substrate prior to applying *any* type of polymer ink within the disclosure of Bao et al. provides no indication to those of skill in the art that inhibition of spreading can be achieved with silicon-containing polymer or oligomer inks that are known in the art to be prone to spreading and, thus, result in poor pattern formation.

In response to Applicants' arguments that the express teaching of silane-containing materials as surface energy modifiers in Bao et al. means that such materials would have been indicated as suitable for the coating material of Bao et al. if that was the case, the Examiner has disagreed and has responded that absent an express teaching, such a conclusion cannot be fairly made. The Applicants submit that, while possibly not dispositive on its own, the observation of the express inclusion of silane-containing

materials as surface energy modifiers, without such materials being indicated as suitable for coating materials, is certainly relevant to the question of what one of ordinary skill in the art would reasonably have been expected to do in view of the teachings of Bao et al. Such features of the disclosure of Bao et al. bolster Applicants' position that those of skill in the art would not use silicon-containing polymers and oligomers for the coating materials based upon known low surface tensions. This feature of the teachings of Bao et al. cannot simply be brushed aside by the Examiner for want of an express teaching that such materials are not suitable for the coating material.

As to the Applicants' position that silicon containing materials have too low of a surface tension to be used as coating materials in Bao et al., the Examiner has responded that silicon-containing materials are used in both the protrusions (relatively high surface energies) and in the recesses (relatively low surface energies). The Applicants note that the surface energy modifiers of Bao et al. are silanes and not polysilanes (which are one class of silicon-containing materials claimed as suitable for the coating material in the instant claims). The silanes taught by Bao et al. only have a single silicon atom, with various other substituents bonded to the silicon atom having a significant effect on surface tension. The fact of the matter is, those of skill in the art recognize that surface energy is highly dependent upon the intermolecular forces between molecules (which can be attributable to substituents groups). However, silicon-containing polymers and oligomers have a very flexible backbone that enables the molecules to arrange in a manner that minimizes surface energy. Consequently, silicon-containing polymers and oligomers, themselves, are recognized by those of skill in the art to generally have low surface tension (see Table I in Van Krevelen and pages 309 and 357 in Clarson et al). Thus, silicon-containing polymers

and oligomers are well known for their ability to spread on a wide range of surfaces. This recognition by those of skill in the art, in addition to the above considerations, is even more significant when it is considered that the polymers indicated as suitable for the ink of Bao et al. have high surface tensions (refer to Table I in Van Krevelen). Such considerations provide yet further support for the Applicants' position that those of ordinary skill in the art would **not** reasonably have been expected to arrive at the claimed invention based upon the teachings of Bao et al. and Clem et al.

Perhaps the most significant flaw in the Examiner's reasoning is the reliance upon the teachings of Clem et al. While the Examiner has opined that Clem et al. teaches use of a polymer ink, no such teachings exists within the express or implicit disclosures of Clem et al. Rather, closer examination of the teachings of Clem et al. reveal that **only polymer precursors** are taught as coating materials that are applied to substrates, with polymerization (i.e., curing) only occurring once the coating material is applied to the substrate. Referring to Clem et al., column 16 starting at line 38 (which is the same section of Clem et al. relied upon by the Examiner to support his position that polymer inks are suitable for purposes of Clem et al.):

“The invention involves, as one aspect, forming a blocking agent pattern on a substrate surface that serves as a mask to CVD, sol-gel processing, or the like. The blocking agent can be a SAM, as described above, or another species such as a polymeric material. SAMs can become polymeric materials when selected appropriately. For example, where organosilanes that are polymerizable are selected to form patterned SAMs on a surface, **they can be made to crosslink at the surface**. For example, a **polymerizable organosilane** can be applied to a stamping surface of an applicator **and the stamping surface of the applicator held in contact with a surface** to be derivatized for an extended period of time. Especially at high concentrations of cross-linkable organosilane, and **long contact times between applicator and the surface**, multi-layer, polymeric material can result.” (Emphasis added).

Referring to column 17, lines 15-19 of Clem et al.:

“Following formation of the blocking agent at the surface via polymerization, concentration and hardening by solvent or carrier diffusion, or the like, the applicator (serving as a micromold in this arrangement) can be removed.” (Emphasis added).

Referring to column 17, lines 35 to 60 of Clem et al.:

“In one example of such a technique, and with reference to FIG. 1a, a fluid precursor of a blocking agent is a solution of monomer in a fluid carrier and is polymerized at the surface of substrate 18 with article 10 in place upon the substrate. Article 10 then is removed, resulting in a polymeric blocking agent on the surface of substrate 18 in a pattern corresponding to the pattern of indentations of the applicator. . . This structure can be thermally polymerized on the substrate surface by heat, photopolymerized if the substrate 18 or applicator 10 is transparent to polymerizing radiation, or polymerized following removal of applicator 10 via heat or photolysis. Free-radical polymerization can be carried out as well. These and other forms of polymerization, including cationic, anionic, copolymerization, chain polymerization, cross-linking, and the like can be employed, and essentially any type of polymer or copolymer formable from a fluid precursor can be patterned on the surface of a substrate in accordance with the invention.”

Clearly, the teachings of Clem et al. that the Examiner has relied upon to find a teaching of a silicon-containing polymer used in microcontact printing do not teach use of polymer ink at all, but rather teach use of precursors as inks that may be polymerized only once disposed on the substrate. In this regard, the teachings of Clem et al. support the Applicants’ position that those of skill in the art generally believe that silicon-containing polymers and oligomers, which do not require curing, cannot be used as inks for soft lithographic techniques. In fact, by teaching that the applicator cannot be removed until polymerization of the precursors, Clem et al. provides excellent teachings to support Applicants’ position that a liquid silicon-containing polymer, which does not require curing, is not known by those of skill in the art to be applied onto substrates through soft lithographic printing.

In view of the above, the Applicants respectfully submit that the Examiner has failed to properly establish obviousness of independent claim 1 in view of the combined teachings of Bao et al. and Clem et al. such that these rejections must be withdrawn. Further, the Applicants respectfully submit that the Examiner cannot properly establish obviousness of independent claim 1 over Bao et al. and any other reference in view of the above-presented considerations, which weigh heavily in favor of non-obviousness of claim 1.

As to the Rejection of Dependent Claim 6 Under 35 U.S.C. §103(a) Over Bao et al. and Clem et al. in View of Spence

In addition to the arguments set forth above, the Applicants further respectfully submit that the rejection of claim 6 is **still** completely without basis. While Bao et al. and Clem et al. teach various plasma processes, and while Spence teaches an atmospheric pressure plasma corona discharge, **none of those references teach introducing an atomized liquid and/or solid coating-forming material into an atmospheric pressure plasma discharge.** Because the Examiner must account for each and every element in a claim to establish a *prima facie* case of obviousness against the claim, the Applicants respectfully submit that the Examiner has failed to properly establish a *prima facie* case of obviousness of dependent claim 6 over the combined teachings of Bao et al., Clem et al., and Spence. The mere disclosure of a corona discharge that is performed at atmospheric pressure (as disclosed by Spence) is completely insufficient to establish obviousness of claim 6 because every element of claim 6 is not accounted for by the combined teachings of Bao et al., Clem et al., and Spence.

As to Patentability of New Independent Claim 22

The Applicants respectfully submit that new independent claim 22 is not subject to any rejection currently set forth by the Examiner. While the Examiner has relied upon Bao et al. to teach corona plasma treatment, atmospheric pressure plasma glow discharge is different from corona discharge as readily appreciated by those of skill in the art such that the rejection of claim 3 would not apply to new claim 22.

The Applicants respectfully submit that all rejections of the claims are overcome such that independent claims 1 and 22, as well as the claims that depend therefrom, are in condition for allowance, which allowance is respectfully requested.

The appropriate fees for a three-month extension of time and a RCE are included herewith. Because there are only two independent claims and less than twenty total claims pending after the instant Amendment, it is believed that no additional fees are due for extra claims. While it is believed that no further fees are presently due, the Commissioner is authorized to charge our deposit account no. 08-2789 for any additional fees or credit the account for any overpayment.

Respectfully submitted,

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